The CHEMIST

April, 1961

Dr. C. C. Price, F.A.I.C., (right) accepting the Honor Scroll of the Philadelphia AIC Chapter from Dr. Milton Harris, AIC President.

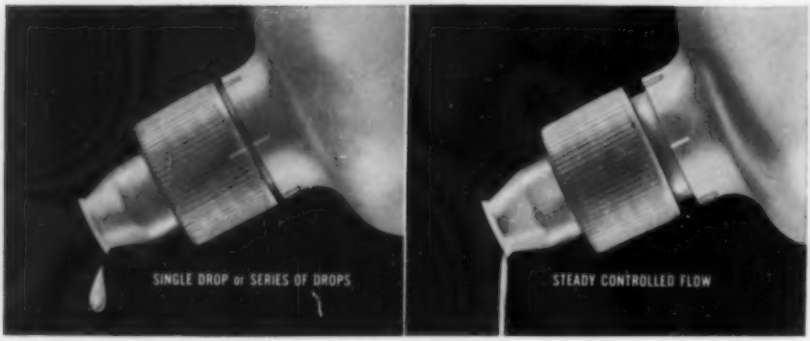
(*See page* 131)

Volume XXXVIII

AMERICAN INSTITUTE OF CHEMISTS

Number 4

New ADJUSTA-FLOW HF bottle* lets you "dial" precise rate of flow



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Slip-on dust cover protects against contamination, double-protects against leakage. Special dripless pouring lip means extra safety; acid remaining in closure flows back into the bottle. Entire 1-lb. container molded of polyethylene and mounted in reinforcing sleeve for firm, safe grip.

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The CHEMIST

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Vol. XXXVIII April, 1961 Number 4

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Deadlines for THE CHEMIST: For the May issue the deadline is April 15.

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THE AMERICAN INSTITUTE OF CHEMISTS does not necessarily endorse any of the facts or opinions advanced in articles which appear in THE CHEMIST.

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To Come in May

Now available is the talk by Victor Cohn, science writer, when he received the Honor Scroll of the Twin City Chapter. He discusses, "Your Fantastic Future," materially and philosophically . . . Dr. Johan Bjorksten, AIC president-elect, presents, "For Scientific Breakthroughs, We Must Go Beyond Restraints." . . . Dr. Claude H. Hills of the Eastern Utilization Research Division, U. S. Department of Agriculture, spoke on "The Methodology and Philosophy of Science," at a meeting of the Philadelphia Chapter, which has made this paper available.

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Program 38th Annual Meeting

The American Institute of Chemists

Place: The Statler-Hilton Hotel, Washington, D.C.
Time: May 10-12, 1961

Thursday, May 11, 1961

8:00 a.m. 5:00 p.m. **Registration** (Michigan Room)

8:00 a.m. **Coffee Hour** (Federal Room)

9:30 a.m. **First Professional Session** (Federal Room)
Greetings and introductory remarks by AIC President, Dr. Milton Harris, Vice President, The Gillette Co., Boston, Mass.

Theme: Washington, the Science Information Center of the Nation.

Granted that many governmental agencies have gathered technical information of significant value to chemists and the chemical industry, how does a chemist pinpoint the repository of the desired information?

Presiding: Dr. Karl F. Heumann, Director of the Office of Documentation, National Academy of Sciences—National Research Council, Washington, D.C.

9:45 a.m. "Chemical Information and the Role of the National Science Foundation," Dr. Burton W. Adkinson, Director, Office of Science Information Service, National Science Foundation.

10:30 a.m. "Communicating Research Results to Science & Industry," John C. Green, Director, Office of Technical Services, Business & Defense Services Administration, U. S. Department of Commerce, Washington, D.C.

11:15 a.m. "How to Increase the Availability to Industry of Unpublished Research and Development Information Generated by Government Contracts," Dr. William E. Hanford, Vice President for Research, Olin Mathieson Chemical Corp., New York, N. Y.

12:15 p.m. **Luncheon** (South American Room) Tickets, $5.00
Presiding: Dr. Richard L. Kenyon, Editorial Director, Applied Publications, American Chemical Society.

Speaker: Mr. Leonard S. Silk, Senior Editor, *Business Week*, New York, N. Y.

Subject: "The Research Revolution"

2:15 p.m. **Second Professional Session**

Theme: The U. S. Patent Office as an Information Center

While the patent-granting function of the U. S. Patent Office is well known, its potentiality as a source of technical information is much less commonly recognized. The afternoon program will be devoted to a demonstration of the organizational structure of the Patent Office, its library, the classification system of patents, the procedure of patent searching, and information services available. There will be opportunities to meet several of the patent examiners during the tour.

This second professional session will be held in the U. S. Patent Office. It will convene in the Auditorium, Department of Commerce, 15th and E Streets, N.W., Washington, D.C. (Special Buses will leave the Statler Hilton Hotel for the Department of Commerce at 1:50 p.m.)

Presiding: Dr. Jacques C. Morrell, Consultant, Washington, D.C.

Greetings by the Commissioner of Patents, U. S. Patent Office, Department of Commerce.

Remarks Introductory to Tour of the Patent Office, by the Assistant Commissioner and other Patent Office officials.

Guided Tour of Patent Office.

"Patents and the Patent Office as a Source of Technical Information," the Hon. Maurice A. Crews, Assistant Commissioner of Patents, U. S. Patent Office.

Discussion: How can officials of the Patent Office make their services more useful to the chemical profession.

(Buses will leave the Department of Commerce for the Statler Hilton Hotel at 4:30 p.m.)

6:30 p.m. **Reception** for the Gold Medalist (South American Room)

7:15 p.m. **Gold Medal Banquet** (Federal Room) Tickets $10.00 (Dress optional)

Toastmaster: Dr. Milton Harris, Retiring AIC President.

Speaker for the Medalist: Dr. Ralph Connor, Chairman of the Board, Rohm & Haas, Philadelphia, Pa.

Presentation of the Gold Medal: Dr. Henry B. Hass, Consultant, Summit, N. J.

Medal Acceptance Address: Dr. Alden H. Emery, Executive Secretary, American Chemical Society.

Friday, May 12, 1961

8:00 a.m. **Breakfast,** Committees on Membership and on New Chapters and Expansion (New York Room) (Pay at the table). $2.50. Open meeting. All AIC members are invited.

8:00 a.m. **Coffee Hour** (Federal Room)

9:30 a.m. **Third Professional Session** (Federal Room)

Theme: Steps being taken in Washington to improve quality and supply of chemists.

There are more funds available for research than there are competent scientists to carry out the needed programs. What steps are being taken to overcome this shortage of well-trained people?

Presiding: Dr. Johan A. Bjorksten, Incoming President, American Institute of Chemists, and President, Bjorksten Research Laboratories, Madison, Wis.

9:30 a.m. "The Ten Most Wanted Chemists," Dr. B. R. Stanerson, Deputy Executive Secretary, American Chemical Society, Washington, D.C.

10:15 a.m. "The National Science Foundation Education Programs in Chemistry," Dr. Keith R. Kelson, Deputy Assistant Director, Scientific Personnel and Education, National Science Foundation.

11:00 a.m. **Debate:** Should the Federal Government receive patent rights to inventions made as a result of Government-financed research?

Moderator: Dean Arthur E. Burns, Dean of the Graduate Council and Professor of Economics, George Washington University, Washington, D.C.

Speakers: Senator Russell B. Long, Louisiana, Chairman of the Monopoly Subcommittee of the Senate Select Committee on Small Business

and

Roger H. Lueck, Vice President for Research, American Can Company, and Chairman of the Research Committee and Member of the Board of Directors of the National Association of Manufacturers.

12:15 p.m. **Reception** (Foyer 3)

12:30 p.m. **Luncheon** (Federal Room) Tickets $5.00

Presiding: Dr. Milton Harris, Retiring President, The American Institute of Chemists.

"Impact of the Federal Scientific Research Program on Technological Progress," The Hon. Richard S. Morse, Assistant Secretary of the Army (Research and Development), U. S. Department of the Army, Washington, D.C.

2:30 p.m. **The 38th Annual Business Meeting of The American Chemists** (California Room)

The 38th Annual Business Meeting of The American Institute of Chemists will be held at the Statler Hilton Hotel, Washington, D.C., at 2:30 p.m., Friday, May 12, 1961, to hear the reports of the President, Chairman of the Board, Treasurer, Secretary, Committees, and Chapters, and for the announcement of the election of a President-elect and Councilors, and for such other business as may be properly presented.

—John Kotrady, Secretary

2:30 p.m. and 4:00 p.m. *Visit and Tours,* American Chemical Society Building, 1155 Sixteenth St., N.W., Washington, D.C.

Ladies' Program

Ladies' Hospitality Headquarters: Michigan Room

Wednesday, May 10, 1961

5:30 p.m. **The President's Reception** to the Officers, National Councilors, Members of the Annual Meeting Committee, and their wives (New York Room).

6:30 p.m. **Dinner** at Bonat's for wives of members of Board of Directors, Council, and Annual Meeting Committee ($3.50).

9:00 p.m. **Conversation and Coffee** (Michigan Room).

Thursday, May 11, 1961

9:00 a.m. **Coffee Hour** (Massachusetts Room) (No charge)

9:30 a.m. Morning free for sightseeing

Some will want to tour the interesting public buildings, the fabulous art galleries, or the famous historic shrines. Others will want to stroll through the parks, go window-shopping on Connecticut Ave., or travel to Mt. Vernon or Arlington National Cemetery. Many wonderful trips and tours are available, for small or large groups, on a Dutch treat basis. An experienced hostess-guide will be present in our Ladies' Hospitality Headquarters to advise on schedules, make reservations, arrange for group tours, etc. She will be assisted by wives of members of the Washington AIC Chapter.

12:15 p.m. **Luncheon** (South American Room) Tickets $5.00

2:00 p.m. (We are trying to arrange an Embassy Tour or a White House Tea.)

6:30 p.m. **Reception** for Gold Medalist (South American Room)

7:15 p.m. **Gold Medal Banquet** (Federal Room) Tickets $10.00

Friday, May 12, 1961

9:00 a.m. **Coffee Hour** (Massachusetts Room) (No Charge)

9:30 a.m. Morning free for sightseeing.

12:30 p.m. **Luncheon** (Federal Room) Tickets $5.00

2:30 p.m. and 4:00 p.m. **Tours** of American Chemical Society Building

Exhibits

The Office of Science Information Service and the Division of Scientific Personnel and Education of the National Science Foundation and the Office of Technical Services of the Department of Commerce will have exhibits in the Michigan Room of the Statler Hilton Hotel.

Registration

Advance Registration		*Registration at Meeting*	
AIC Members	$10.00	AIC Members	$12.00
Non-Members	10.00	Non-Members	12.00
Students	2.00	Students	2.00

(There is no registration fee for wives of registrants and for persons attending the luncheons only.)

Advance registration forms will be mailed to all AIC members about April 10. Registration forms may also be requested from The American Institute of Chemists, 60 E. 42nd St., New York 17, N. Y.

Hotel reservations should be sent directly to the Statler Hilton Hotel, Washington, D.C.

It is important that advance registration and payment be received by May 1, 1961, so that adequate accommodations can be provided. Please make all checks payable to Robert C. Watson, Treasurer, and mail checks with registration to Paul E. Reichardt, Washington Gas Light Company, 1100 H Street, N.W., Washington 5, D.C.

Wednesday Evening, May 10, 1961

(For Officers, Councilors, and Annual Meeting Committees)

5:00 p.m. **Registration** (Michigan Room)

5:30 p.m. **The President's Reception** to the Officers, National Councilors, Members of the Annual Meeting Committee, and their wives. (New York Room)

6:30 p.m. **Dinner meeting** of the Board of Directors, Council, and Annual Meeting Committee. (Pan American Room) (Pay at table). (See Ladies' Program for wives of those attending this dinner.)

May in Washington offers:

For the scientist: Dozens of government laboratories in all fields.

For the Bibliophile and Student: Five universities and many famous libraries.

For the Tourist: Dozens of beauty spots, historic buildings and monuments, government institutions.

For the Outdoor Enthusiast: Fishing in Chesapeake Bay or nearby fresh waters, or hiking along historic C & O Canal.

For the Civil War Buff: Visits to nearby Bull Run (Manassas), Antietam (Sharpsburg), or Gettysburg.

COME, plan to spend the weekend to see your Capital—and do it all in May weather, the kind you dream about!

Special AIC Announcements

Honorary Membership to Lloyd Van Doren

The presentation of Honorary AIC Membership to Dr. Lloyd Van Doren, long-time Secretary of the AIC (now retired), will be made at a meeting of the New York AIC Chapter, to be held April 27, 1961, at the Shelburne Hotel, New York, N. Y.

Honorary Membership to James Perry

The award of Honorary AIC Membership to James W. Perry, F.A.I.C., of the Systems Engineering Department of the College of Engineering at the University of Arizona, will be presented April 22, 1961, at the university in Tucson, Arizona. The ceremony will conclude a day-long program on information retrieval, entitled, "Living with Computers and Their Offspring."

New Golden Gate Chapter Officers

The new Golden Gate AIC Chapter, covering Northern California, at its organization meeting (see page 145), elected the following temporary officers:

Chairman, Paul D. Williams, 245 Grove Drive, Portola Valley, Calif.
Vice-Chairman, Program, Robert J. Mackey, 1800 Elm St., San Carlos, Calif.
Secretary-Treasurer, Dr. Joseph A. Fuller, 14 Rowan Way, Mill Valley, Calif.

Election Ballots

The names selected by the AIC membership, from the Nomination Ballots, of candidates for the positions of President-elect and Councilors will appear on the Election Ballots to be mailed about April 10. Please vote and return Election Ballots promptly. The results will be announced at the AIC Business Meeting to be held during the 38th Annual Meeting in May.

Committee Additions

The Committee on New Chapters and Expansion, of which Martin B. Williams is chairman, has added three new members:

Dr. Lawrence Flett,
New London, New Hampshire
Prof. R. Norris Shreve,
Lafayette, Ind.
Dr. Vanderveer Voorhees,
Los Altos, Calif.

AAAS Fellow Membership

Fellows of the AIC are deemed to meet the requirements of, and are eligible for, automatic election as Fellows of The American Association for the Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D.C.

Please Note

In the list of officers elected by the Virginia Chapter, page 78, March CHEMIST, the name of the *Treasurer* should be: William J. Nissley (not Nessley).

Who's Where?

Martin B. Williams, F.A.I.C.
Chairman, AIC Committee on New Chapters and Expansion

THE AMERICAN INSTITUTE OF CHEMISTS has established a number of new chapters within the past two years to make it possible for all members to participate more readily in the activities of local Chapters. A number of requests have been received recently concerning the territory covered by the Chapters and the persons to contact for information. All of the present Chapters and the officials to contact in each are listed below:

Alabama: Includes the State of Alabama and that part of Florida west of the Appalachicola River. *Chairman*: Oscar L. Hurtt, Jr., 405 South 85th St., Birmingham, Ala. *Secretary*: Robert E. Lacey, 414 Kenilworth Drive, Birmingham, Ala.

Baltimore: The State of Maryland, except Allegany, Calvert, Charles, Frederick, Garrett, Howard, Montgomery, Prince George, Saint Marys, and Washington Counties, which are attached to the Washington Chapter. *Chairman*: Raymond C. Crippen, 5103 Crosswood Ave., Baltimore 14, Md.

Beaver Falls: Includes Upper New York State, bounded by a line from Oswego to Syracuse, east to Utica, northeast through Glens Falls, and on to the New York-Vermont border. *Chairman*: Dr. Fritz Rosenthal, Knowlton Bros., Inc., Watertown, N. Y. *Secretary*: John C. Parsell, Box 97, Beaver Falls, N. Y.

Chicago: The States of Illinois and Indiana. *Chairman*: David W. Young, 18508 Clyde Ave., Homewood, Ill. *Secretary*: Miss Helen Selin, 6916 N. Wayne Ave., Chicago 26, Ill.

Connecticut: The State of Connecticut. *Chairman-elect*: Dr. Frank J. Steele, Greenwich Hospital, Greenwich, Conn.

Delaware: The State of Delaware plus Atlantic, Cape May, Cumberland, and Salem Counties in New Jersey. *Chairman*: Dr. Albert W. Bauer, "Freon" Products Lab., E. I. du Pont de Nemours & Co., Wilmington 5, Del. *Secretary*: Dr. W. W. Thomas, Research Dept., Hercules Powder Co., Wilmington 99, Del.

Florida: The State of Florida, except the panhandle west of the Appalachicola River, also Puerto Rico, the Caribbean, Central and South America. *Chairman*: D. H. Killeffer, P.O. Box 443, Clearwater, Fla. *Secretary*: Robert A. Nanz, Florida Chemists & Engineers, Inc., 645 Rugby Ave., Orlando, Fla.

Golden Gate: The State of California north of Parallel 36. Dr. Vanderveer Voorhees, 12710 El Monte Road, Los Altos, Calif., or Paul D. Williams, 245 Grove Drive, Portola Valley, Calif.

Louisiana: The States of Louisiana, Arkansas, and Mississippi. *Chairman*: Mack F. Stansbury, Southern Utilization Research, R & D Div., 1100 Robert E. Lee Blvd., New Orleans 19, La. *Secretary-Treasurer*: Lawrence E. Brown, 805 Andrews, Metairie, La.

Michigan: The State of Michigan. *Chairman pro tem*: Dr. Sumner B. Twiss, president, Cycleweld Chemical Products Div., Chrysler Corp., 6437 West Jefferson, Trenton, Mich.

Midwest: The States of Kansas, Nebraska, Colorado, Iowa, and Missouri. *Chairman*: Dr. A. Ernest MacGee, 4619 Jefferson St., Kansas City 12, Mo. *Secretary*: Richard D. Radford, 2223 East 68th St., Kansas City, Mo.

New England: The States of Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts. *Chairman*: Dr. J. Horace Faull, Jr., 72 Fresh Pond Lane, Cambridge 38, Mass. *Secretary-Treasurer*: Sumner Levine, 149 Lockland Ave., Framingham, Mass.

New Jersey: The State of New Jersey except Atlantic, Cape May, Cumberland, Salem, Burlington, Camden, and Gloucester Counties. *Chairman*: Dr. John F. Mahoney, 1000 Woodmere Drive, Westfield, N. J. *Secretary*: Dr. Ralph M. Hill, 24 Bayberry Lane, Mountainside, N. J.

New York: The State of New York north to Albany and east of the Catskill Mountains. *Chairman*: Dr. John L. Hickson, Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y. *Secretary pro tem*: Mildred Hunt, Sugar Research Foundation.

Niagara: The State of New York West of the Catskill Mountains (excluding the Beaver Falls Chapter). *Acting Chairman*: Frederick L. Koethen, 2494 River Road, Niagara Falls, N. Y. *Secretary*: Dr. Howard W. Post, 94 N. Ellicott St., Williamsville, N. Y.

North Carolina: The State of North Carolina except Halifax County. *Chairman pro tem*: Dr. Joseph A. Weybrew, 805 W. Pineland Drive, Raleigh, N. C.

Northwest: The States of Oregon, Washington, Idaho, Montana, and Alaska. *Chairman pro tem*: E. L. Gutberlet, 4106 Airport Way, Seattle 8, Washington.

Ohio: The States of Ohio and Kentucky. *Chairman*: John Dickenson, IV, 2894 Fontenay Road, Shaker Heights 20, Ohio. *Secretary-Treasurer*: Thomas W. Riener, 200 Laverne Ave., Rocky River 6, Ohio.

Philadelphia: The State of Pennsylvania east of a line from north to south at University Park (University Park members are in the Philadelphia Chapter); also includes Burlington, Camden and Gloucester Counties of New Jersey. *Chairman*: Dr. E. M. Kipp, 161 Hunters Lane, Devon, Pa. *Secretary*: Dr. Ezra H. Bitcover, 8237 Michener Ave., Philadelphia 50, Pa.

Piedmont: The States of Georgia and South Carolina. *Chairman*: Dr. Ivy M. Parker, Plantation Pipe Line Co., P.O. Box 1743, Atlanta 1, Ga. *Secretary-Treasurer*: W. I. Wynn, 1960 Westminster Way, N.E., Atlanta 7, Ga.

Pittsburgh: The State of Pennsylvania west of a line from north to south at University Park, Pa., and the State of West Virginia. *Chairman*: Emerson Venable, 6111 Fifth Ave., Pittsburgh 32, Pa. *Secretary-Treasurer*: Dr. Robert W. Freedman, 5028 Debra Drive, Pittsburgh 36, Pa.

Southwest: The States of New Mexico, Texas, and Oklahoma. *Chairman pro tem*: Dr. Robert D. Schwartz, 3019 Linkwood Drive, Houston 25, Texas.

Tennessee: The State of Tennessee. *Secretary-Treasurer*: Dr. Charles A. Horton, 384 East Drive, Oak Ridge, Tenn.

Twin City: The States of Minnesota, North Dakota, and South Dakota. *Chairman*: Dr. H. L. Weisbecker, 2138 Berkeley Ave., St. Paul 5, Minn. *Secretary*: Mrs. Virginia Carletta, 357 Hope St., St. Paul 6, Minn.

Virginia: The State of Virginia, except Loudon, Fairfax, Arlington and Prince William Counties and the City of Alexandria. Also includes Halifax County, North Carolina. *Chairman*: Dr. Lee S. Harrow, Philip Morris, Inc., P.O. Box 3D, Richmond 6, Va. *Secretary*: Robert Anderson, 104 LaSalle Drive, Richmond, Va.

Washington: The District of Columbia plus Loudon, Fairfax, Arlington and Prince William Counties and the City of Alexandria in Virginia, and adjacent Counties of Maryland (see list under Baltimore Chapter). *Chairman*: Dr. Clem O. Miller, 6 Nicholson Road, Falls Church, Va. *Secretary*: Dr. Anthony M. Schwartz, Harris Research Labs., 6220 Kansas Ave., N.E., Washington 11, D.C.

Western: The State of California south of parallel 36, and the States of Arizona, Utah, Nevada, and Wyoming. *Chairman*: Stuart R. Garnett, 506 West Almond St., Compton 4, Calif. *Executive Secretary*: George H. Dye, 727 Divina Vista, Monterey Park, Calif. *Recording Secretary*: Dr. Karol Mysels, University of Southern California, Los Angeles 7, Calif.

Wisconsin: The State of Wisconsin. *Chairman pro tem*: James E. Henning, 4914 Marathon St., Madison, Wisconsin.

Chapter boundaries are usually located along State lines, with a few exceptions. Normal patterns of travel have been anticipated to make it possible for each AIC member to actively participate in the Chapter most accessible to him. There is no objection, however, to individuals belonging to the Chapter of their choice. For example, if some in eastern Connecticut would prefer to be associated with the New England Chapter, which most often meets in Boston, they may send their names to the AIC Secretary, requesting transfer to the New England Chapter.

Plans for the future call for the establishment of additional Chapters —several locations have been chosen, and members of the Committee are working in these areas, but the field is still open. Any AIC member who would like to have a local chapter in his area, but who has not yet been asked to help form one, should write to me at 549 Walnut St., Centreville, Alabama. Four years ago the Alabama Chapter had only 12 members and was dormant. It now has approximately 100 members and a full program of activities. This increase in size and activity can readily be duplicated elsewhere, North, South, East, or West, in a town of 500 or a city of 1,000,000.

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The Gordon Research Conferences — 1961

The 1961 Gordon Research Conferences will be held June 12, to September 1, 1961, in New Hampshire. They were established to stimulate research in universities, research foundations and industrial laboratories. They feature lectures and discussion groups, without publication.

Attendance at the Conferences is by application, made two months prior to the Conference. Each Conference is limited to about 100 conferees. Request application forms and information from Dr. W. George Parks, Director of the Conferences, Department of Chemistry, University of Rhode Island, Kingston, R.I.

The subjects of the Conferences, are:

At Colby Junior College, New London, N. H.

Petroleum, June 12-16
Catalysis, June 19-23
Nuclear Chemistry, June 26-30
Polymers, July 3-7
Textiles, July 10-14
Elastomers, July 17-21
Corrosion-Oxidation of Metal Surfaces, July 24-28
Medicinal Chemistry, July 31-Aug. 4
Separation & Purification, Aug. 7-11
Instrumentation, Aug. 14-18
Food & Nutrition, Aug. 21-25
Cancer, Aug. 28-Sept. 1

At New Hampton School, New Hampton, N. H.

Chemistry of Coal, June 12-16
Chemistry & Physics of Liquids, June 19-23
Proteins, June 26-30
Scientific Information Problems in Research, July 3-7
Magnetic Resonance, July 10-14
Radiation Chemistry, July 17-21
Organic Reactions & Processes, July 24-28
Steroids & Other Natural Products, July 31-Aug. 4
Statistics in Chemistry & Chemical Engineering, Aug. 7-11
Analytical Chemistry, Aug. 14-18
Inorganic Chemistry, Aug. 21-25
Adhesion, Aug. 28-Sept. 1

At Kimball Union Academy, Meriden, N. H.

Lipide Metabolism, June 12-16
Cell Structure & Metabolism, June 19-23
Physical Metallurgy, June 26-30
Vitamins & Metabolism, July 3-7
Chemistry, Physiology & Structure of Bones and Teeth, July 10-14
Organic Coatings, July 17-21
Chemistry at Interfaces, July 24-28
Solid State Studies in Ceramics, July 31-Aug. 4
Toxicology & Safety Evaluations, Aug. 7-11
Chemistry & Physics of Solids, Aug. 14-18
Photonuclear Reactions, Aug. 21-25
High Temperature Chemistry— Molten Salts, Aug. 28-Sept. 1

At Tilton School, Tilton, N. H.

Ion Exchange, June 26-30
Chemistry of Carbohydrates, July 3-7
Chemistry & Metallurgy of Semiconductors, July 10-14
Microbiological Deterioration, July 17-21
Biochemistry & Agriculture, July 24-28
Electrodeposition, July 31-Aug. 4
Glass, Aug. 7-11

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Qualifications of Science Teachers in New Jersey High Schools

Chester A. Amick, F.A.I.C.
121 East Maple Ave., Bound Brook, N. J.

A PANEL discussion on "Qualifications of Science Teachers in New Jersey" was held March 7, 1961, by the New Jersey AIC Chapter, at the Chemistry Lecture Room of Rutgers University, New Brunswick, N. J. Dr. John F. Mahoney, chairman of the New Jersey Chapter presided.

Dr. Richard Scheetz, coordinator of the School Program, Department of Education, State of New Jersey, commented on the situation that existed one year "B.S.—before Sputnik." At that time, 1955-56, 2% of the science and mathematics teachers had no degree; 44% had an M.A., and 54% had a Master's "plus." He said that 50% of the S. and M. teachers in New Jersey were graduates of B.A. Colleges, while 60% were prepared in out-of-state schools. As a result, many of these teachers do not meet the certification requirements of New Jersey, particularly as regards the "teachers' profession," that is in the profession of teaching. He concluded that it was as important, perhaps more so, that a good S. and M. teacher know *how* to teach as well as to know his subject matter.

Dr. John Navarra, chairman, Department of Science, Jersey City State (Teachers) College, carried on the importance of an "educational" background, particularly for high school teachers. They should have a broad background in all science, including general science, biology, space science, physics and chemistry. He believes that there is considerable repetition and that our present courses are out-dated. As he expressed it, "The impact of science has not been changed in the last forty years." He sug-

gested more rigorous courses, from the kindergarten through high school, with atomic energy studies starting in the fifth grade. Teachers should be trained to *teach*. When they are trained as chemists, physicists, or biologists, they are "grabbed" by industry and lost to the teaching profession. Teaching scientists cannot receive financial compensation of the order given to industrial scientists.

Dr. John Dayon of General Aniline discussed his experiences in New York, particularly with the Board of Regents. As late as May, 1956, the Regents suggested that a teacher be certified if he had 6-12 hours in his subject and 18-24 hours in his profession (education). Your reporter was intrigued by the terrific resistance on the part of the Board of Regents to a change in these requirements, and by the determination of the Committee on Education, headed by Dr. Dayon, to improve the subject requirement. Readers are referred to a letter to the Editor of the *New York Times* for April 7, 1958, summarizing these activities.

Mr. Max D. Blumenfeld, superintendent of the Princeton plant of the American Cyanamid Company, was the final panelist. His subject was based on "How Can Non-educators Help Educators?" He then discussed the results of the work that 18 organizations working together—companies, research laboratories, professional societies—had done in the Princeton area. This group met with the teachers and administrators of the schools in this area and an overall project was developed to:

(1) Encourage high school pupils to think seriously about careers in science.
(2) Loan expensive equipment to schools for special demonstrations, such as Geiger counters, vacuum pumps, etc.
(3) Provide talented speakers for special projects.
(4) Provide opportunities for plant visitations.
(5) Provide summer employment for teachers.
(6) Provide lectures for teachers in special fields.

Mr. Blumenfeld summed it up nicely with the comment, "With men of good will, interested in their community, much good can be done; make people literate in science, not necessarily scientists."

Courses, for industrial scientists, in the use of specialized tools in chemistry and physics are offered for this summer by Polytechnic Institute of Brooklyn. Request information from Mrs. Doris Cattell, Polytechnic Institute of Brooklyn, 333 Jay St., Brooklyn 1, N. Y.

The 16th Purdue Industrial Waste Conference will be held May 2-4, 1961, in the Purdue Memorial Center, Lafayette, Ind. For information: Prof. Don E. Bloodgood, Chairman of Conference, School of Civil Engineering, Purdue University, Lafayette, Ind.

About AIC Members

Dr. A. E. Wood, F.A.I.C., professor emeritus, Mississippi College, Clinton, Miss., received an honor scroll from the Mississippi Section of the American Chemical Society, in February, for "fifty years of outstanding and unceasing efforts in behalf of chemical education and the chemical industry in the state of Mississippi." Dr. Wood teaches as visiting professor at a nearby college, is writing and researching, counseling future chemists, and working on the new Industrial and Technological Research Commission, under Governor Ross Barnett of Mississippi.

Raymond Stevens, Hon. AIC, will serve as president and chief executive officer of Arthur D. Little, Inc., Cambridge 40, Mass., during the absence of Lt. Gen. James M. Gavin, recently appointed U. S. Ambassador to France.

Richard S. Robinson, F.A.I.C., has been named a vice president of Arthur D. Little, Inc., Cambridge 40, Mass. He joined the company in 1948.

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Dr. James D. D'Ianni, F.A.I.C., assistant to the vice president in the Research & Development Division of Goodyear Tire & Rubber Co., Akron, Ohio, has been appointed by the National Academy of Sciences-NRC to the Committee on Organic Materials of the Academy's Materials Advisory Board.

Dr. Emil Ott, F.A.I.C., former AIC president, is at the Wright Laboratory, School of Chemistry, Rutgers University, New Brunswick, N. J., as research specialist. He is continuing consulting for Food Machinery & Chemical Corp., and some other companies.

Lewis E. Harris, F.A.I.C., president of Harris Laboratories, Inc., Lincoln, Neb., is also president of the American Council of Independent Laboratories. Its headquarters are at 4302 East-West Highway, Washington 14, D.C. **Dr. Roger W. Truesdail,** F.A.I.C., president of Truesdail Laboratories, Inc., Los Angeles, Calif., is secretary.

Foster D. Snell, Hon. AIC, announces that the Sperling Laboratories Division of Foster D. Snell, Inc., New York chemical consultants, has moved its facilities from Arlington, Va., to the Snell-owned premises at 1500 Guilford Ave., Baltimore, Md. The Sperling Division is devoted to pharmacology and toxicology.

Life With Chemistry

Dr. Kurt S. Konigsbacher, F.A.I.C.

DO you watch "The Untouchables" on television? Let's assume you don't, and let me give you a short synopsis of a recent episode:

> "Good" chemists have found a new way to denature alcohol so that it cannot be converted to liquor. "Bad" chemists work frantically to find a way to re-nature alcohol so that it can be made into bootleg booze. This controversy continued for an hour, with the gallant Mr. Ness finally triumphant. I am sure you can fill in all the little details for yourself.

What is the moral of the story? "Good" chemists work for Uncle Sam and probably earn no more than an adequate salary. "Bad" chemists work for The Syndicate and make just scads of money. As a matter of fact, the story tells how one of them became a multi-millionaire in a matter of weeks. But does it pay to be dishonest? Well, I don't know. In the end, the "bad" chemists are either dead or in jail, while the good ones presumably went on to greater glory on behalf of the Bureau of Internal Revenue, and for the sake of science.

This is a story of life—and death—with chemistry, on TV.

Dr. Eugene Lieber, F.A.I.C., chairman, Department of Chemistry, Roosevelt University, Chicago 5, Ill., presided at the Workshop Session of the Business Research Conference, held at the University, March 29. **David W. Young,** F.A.I.C., chairman of the Chicago Chapter spoke at the session on "How to Make Inventions."

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Dr. Glenn T. Seaborg, Hon. AIC, chairman of the Atomic Energy Commission, has announced that Warren C. Johnson, vice president and professor of chemistry, University of Chicago, will receive the U. S. AEC Citation for his chairmanship (last year) of the General Advisory Committee to the AEC.

Dr. C. H. Fisher, F.A.I.C., division director, announces that three new research laboratories have been created at the U. S. Department of Agriculture's Southern Utilization Research & Development Division, New Orleans, La. They are: Cotton Chemical Reactions Laboratory, Cotton Physical Properties Laboratory, and Naval Stores Laboratory at Olustee, Fla.

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Dr. Bernard L. Oser, F.A.I.C., director, Food & Drug Research Laboratories, Inc., Maspeth 78, N. Y., marked his 35th anniversary with the company on Jan. 17. Recently he served as a representative of the U. S. on the Joint FAO/WHO Expert Committee on Food Additives at their meeting in Switzerland on "Evaluation of the Carcinogenic Hazards of Food Additives."

Bernard R. Krashin, F.A.I.C., recently appointed vice president-marketing of Air Reduction Chemical & Carbide Co., a newly-formed division of Air Reduction Co., Inc., is transferring his offices from Ohio to the New York headquarters at 150 East 42nd St., New York 17.

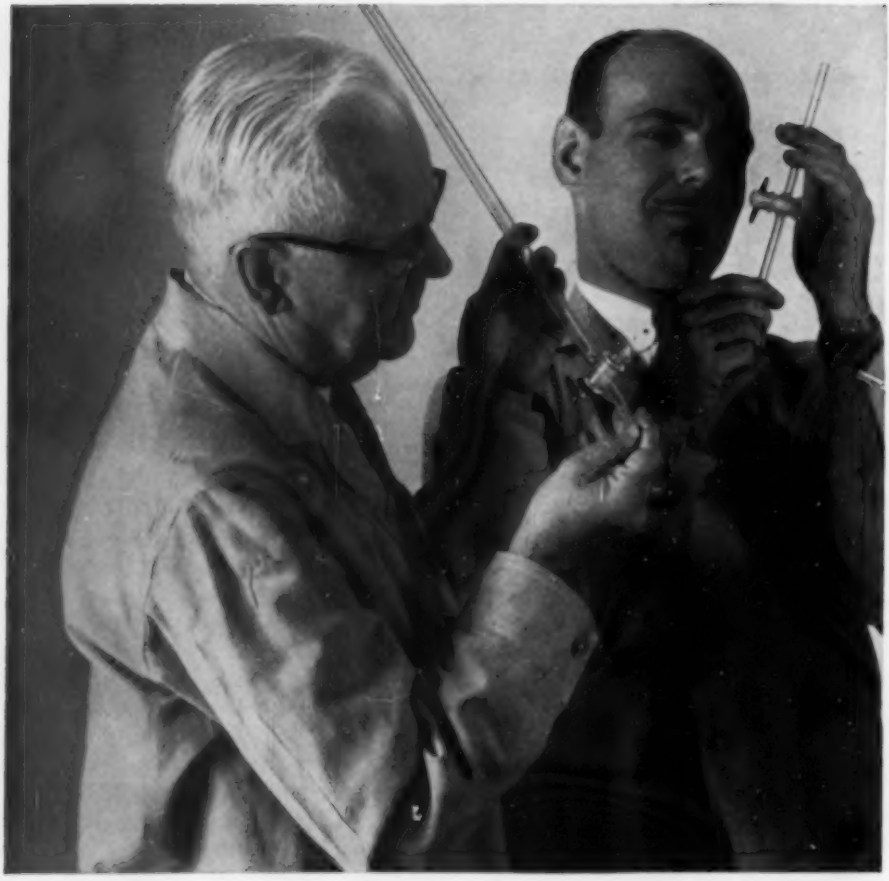
Dr. Louis P. Hammett, F.A.I.C., of Columbia University, has received the 1961 Priestley Medal for his achievements in physical chemistry. Presentation was made during the meeting of the American Chemical Society in St. Louis, March 21-30, 1961.

J. Donald Moulton, F.A.I.C., who has retired as manager of engineering and research for the Nickel Alkaline Battery Division of the Electric Storage Battery Company, has been appointed by Dr. George M. Anderson, president of the Thomas A. Edison Research Lab., McGraw-Edison Co., West Orange, N. J., as consultant to Dr. Philip F. Grieger, head of the Chemistry Department. Mr. Moulton resides at 13 Condit Terrace, West Orange, N. J.

Joseph F. Greene, F.A.I.C., recently manager of customer research for the Blown & Tube Division of Kimble Glass Company (subsidiary of Owens-Illinois Glass Co.), Vineland, N. J., retired Feb. 28. With Mrs. Greene he will travel in Europe until Fall.

Dr. Garrett W. Thiessen, F.A.I.C., professor of chemistry, Monmouth College, Monmouth, Ill., spoke on "The Battle of Lake Regillus — Three Columns and two Brothers," at a meeting of the Pure Oil Research Center Branch of RESA, Jan. 18. His hobbies include Roman-Christian history. On Jan. 19, he spoke before the Chicago Section of the Electrochemical Society on "The Kolbe Electrolysis."

General Vacuum Corp., formerly located in East Boston, Mass., has moved to its new plant at 81 Hicks Ave., Medford, Mass.



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part of the glass, not an enamel put into etch marks—the enamel can wear away and the etch marks weaken the glass, so we eliminated both. Look at the tip under a glass and you'll see *two* ground bevels—they take away sharp edges which can snag and chip.

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R. E. Horsey, F.A.I.C., vice president in charge of sales of the Sindar Corp., New York 36, N. Y., an associate of Givaudan-Delawanna, Inc., presided over a four-day sales meeting in February, at which all sales personnel in the U. S. and Canada met in New York and also visited the company's plant at Delawanna, N. J.

Warren Blumenthal, F.A.I.C., chief of chemical research, Titanium Alloy Mfg. Div., National Lead Co., Niagara Falls, whose avocation is the study of the Bible, spoke on "Jeremiah, Prophet and Teacher," at the First Unitarian Church, Niagara Falls, N. Y., Jan. 29.

Mildred Hunt, F.A.I.C., technical librarian of the Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y., has compiled a booklet entitled, "Patents on the Reactions of Sugar," a revision of an earlier booklet of the same title. A copy may be obtained from the Sugar Research Foundation.

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Goodwin Joss, F.A.I.C., announces the sale of The Goodwin Joss Laboratories, Minneapolis 15, Minn., to Ed. O. Locke of Lyndhurst, N. J. Mr. Joss has also resigned as deputy coroner and toxicological chemist of Hennepin County, Minn., a position he has held for 18 years. He has retired for the present and is spending the winter in Phoenix, Arizona.

Dr. Robert N. DuPuis, F.A.I.C., vice president-research, General Foods, White Plains, N. Y., announces that Dr. B. F. Daubert has been appointed director of scientific research; Dr. Domenic DeFelice, director of scientific development; Dr. H. B. Smith, director of research planning, and G. A. Kolman, director of Research Center operations.

Dr. Frederick A. Lowenheim, F.A.I.C., of Metal and Thermit Corp., Rahway, N. J., has been praised by Union Junior College, Cranford, N. J., for his exceptional ability to learn Russian quickly. Prof. Arnold J. Keen, UJC instructor, said, "He is the best. He works like a Trojan and is most attentive, busy as he is."

James W. Perry, F.A.I.C., of the University of Arizona, has just published the second edition of *"Scientific Russian,"* a textbook for classes and self-study. (Interscience Publishers, Inc., New York 1, N. Y. $9.50).

How Chemists Create a New Product

Dr. Charles C. Price, F.A.I.C.

Blanchard Professor of Chemistry and Chairman of the Department of Chemistry, University of Pennsylvania, Philadelphia, Pa.

(Address given when the author received the Honor Scroll of the Philadelphia AIC Chapter, Feb. 2, 1961, in Philadelphia, Pa.)

THIS is the story of the creation and development of a basically new type of synthetic rubber, differing radically from natural and conventional synthetic rubbers in having oxygen atoms built into the polymer chain sequence. In addition to the fundamental scientific concepts and the important ways this idea has affected my research activities, one practical embodiment is a superior foam rubber now being produced at a rate approaching 100,000,000 lbs. per year, scarcely three years after its commercial debut; another may become the basis for a new type of first-class tire rubber.

In the Fall of 1948, the National Academy of Science Quartermaster Advisory Committee on Elastomers was concerned with developing new approaches in the search for superior new rubbery materials serviceable at low temperatures and resistant to organic solvents. We thought that new approaches might result from leisurely discussion by a small group of chemists and physicists acquainted with pertinent kinetic and thermodynamic concepts. I agreed to organize such a meeting, which was held in Washington the last three days of Jan. 1949. The group included: Drs. John G. Aston, William O. Baker, C. S. Fuller, Peter J. Debye, F.A.I.C., Paul J. Flory, George E. Kimball, M. Mooney, R. H. Ewart, Kenneth S. Pitzer, F.A.I.C., W. B. Reynolds, Frederick D. Rossini, F.A.I.C:, R. Simha, F.A.I.C., L. A. Wood and F. T. Wall.

From this fruitful discussion many specific recommendations were passed on to a larger meeting representing most of the elastomer research teams in universities, government, and industry. The basic concepts of a rubber structure were formulated as a three-dimensional, net-work structure with long-chain, randomly-coiled segments of polymer between cross-links. For these chain segments to permit rubbery properties, the chains must be able to coil and uncoil readily from thermal energy available at the ambient temperature of use. This requirement imposes the conditions that the units of the polymer chain must (1) have low intrachain barriers to rotation, (2) have low interchain Van der Waal's forces (so that chains can readily slip past one another during stress and relaxation) and (3)

have sufficient disymmetry to prevent crystallization of chain segments at use temperatures.

It struck me that a chain segment meeting these requirements was that derived from polymerization of propylene oxide, and this idea was incorporated in the recommendations of the conference. The oxygen atom in the chain would contribute greatly to the flexibility, since the barrier to rotation at carbon-oxygen bonds (1200 cals./mole) was much less than that for carbon-carbon bonds (2800 cals./mole in ethane). Ethers have relatively low "cohesive energy" densities between molecules, so interchain "stickiness" would be expected to be low. Since even relatively low molecular weight poly(ethylene oxide) was a crystalline solid (m.p. *ca.* 65°), while polymers of propylene oxide of molecular weight near 2000 were liquids at temperatures down to or below -50°C., the methyl group in the latter evidently conferred the necessary disymmetry to obstruct crystallinity. The extra methyl group would also be expected to confer greater resistance to dissolution or swelling by water.

On returning to Notre Dame, a look at the literature revealed obstacles to preparation from poly(propylene oxide) of the kind of long segment network structure essential for rubbery properties. Whereas Prof. Staudinger had reported poly(ethylene oxide) with a molecular weight of 20,000[1], there were no reports of poly(propylene oxide) with a molecular weight over a few thousand, among many disclosures of polymerization conditions and catalysts. Elucidation of the reason for this remarkable difference between ethylene and propylene oxides were the basis for many years of research by my students, but the fact obstructed preparation of a rubber network by the conventional procedures of vulcanization, involving crosslinking relatively high-molecular weight linear polymer.

Another approach of promise occurred to me. It involved preparing low-molecular weight poly(propylene oxide) with two or more terminal hydroxyl groups and then using these reactive groups to build up the necessary molecular weight and network structure.

Since "Vulcollan" had been announced by the Bayer Co., involving the conversion of low molecular weight polyesters terminated by hydroxyl groups to rubber by reaction with polyfunctional isocyanates, a similar approach was considered for the initial effort with polyether glycols. By varying the molecular weight of the polyglycol reactant, as well as the ratio of diol to polyol component in the polyglycol, one can vary the distance between crosslinks at will.

Ralph Herbst, who had finished his thesis on the kinetics of benzoyl

peroxide decomposition with me in March 1949, was invited to begin work at Notre Dame on this approach, with some financial support kindly supplied by General Tire & Rubber Co. as a supplement to my fellowship program with them. Almost his first experiments involved sodium-catalyzed polymerization of propylene oxide containing 5 mole-% of pentaerythritol. When this viscous liquid was treated with toluene diisocyanate, it reacted readily and exothermally to produce either hard, insoluble resins or rubbers. He showed that the poly(propylene oxide) glycol he had prepared had a molecular weight of about 650 and that he could also prepare rubbery products from it by reaction, not only with diisocyanates, but also through ester groups with succinic, maleic and several other dibasic acids. He also prepared a rubbery polyurethan from linear poly(propylene oxide) glycol.

Various aspects of this were explored further at General Tire, especially by Dr. Charles E. Greene. The concept and supporting experimental results were submitted as a patent application in 1953. Claims covering the linear glycol polyurethan and the branched chain glycol polyester were disallowed, but the patent issued 30 Dec. 1958, with claims covering products made from branched poly(propylene oxide) glycol with a minimum molecular weight of 600 and containing 0.1 to 5% or 0.1 to 10% of a polyhydric alcohol such as glycerol or pentaerythritol.[2]

Sometime before our patent issued, several companies developed extremely useful and practical procedures for making an excellent flexible polyurethan foam by a "one-shot" process utilizing poly(propylene oxide) of approximately 2000 molecular weight prepared with 2-3% of glycerol. This process has been dramatically successful. Production in 1960 was estimated at 75,000,000 pounds with further expansion expected.

Two other important patent developments relevant to the development of poly(propylene oxide) polyurethan rubber, were: An American patent issued Aug. 9, 1960, to Windemuth, Schnell & Bayer[3], filed in Germany, 10 May 1951, and assigned to Mobay and to Bayer. This patent claims products and processes of condensation of diisocyanates with poly(alkylene ethers) with at least two hydroxyl groups per molecule and of molecular weight above 500. While the claims cover all poly(alkylene oxides), the disclosure and examples mention only poly(ethylene oxide). These German chemists were working in a laboratory which led the world in developing polyester polyurethans. In a patent filed over two years after our conception and reduction to practice, they had clearly failed to recognize the significant advantages of the propylene oxide unit over the ethylene oxide unit in decreasing water sensitivity and crystallization.

On the basis of an application filed by Saunders and Heiss a few weeks before ours, Mobay has been allowed to copy some of our claims (0.1-10% polyol) but not others (0.1-5% polyol) and an interference was declared on this basis some months after our patent issued. This interference has so far obstructed enforcement of even the uncontested claims of our patent. The basis of the interference were several examples encompassing branched-chain poly(propylene oxide) stated to be a condensation product of 13.2 moles of propylene oxide with one mole of glycerol, which was then condensed with a diisocyanate. The issue has not yet been resolved by the Board of Interferences. We feel that the Saunders and Heiss application lacks, either explicitly or inherently, the basis of meeting the 600 molecular weight limitation on the polyglycol of our claims. Our date of conception was 2 years earlier than that of Saunders and Heiss; our first preparation of polyurethan rubber was 4 years earlier. We believe there is justifiable optimism for a favorable ruling—a biased conjecture!

Less controversial scientific facets of propylene oxide polymerization have received much attention in the past ten years: First was the initially frustrating refusal of propylene oxide to produce polymer of nearly as high molecular weight as had been obtained with ethylene oxide. With hot sodium hydroxide, polymer with a molecular weight of 1000 or two was obtained. With acid catalysts the situation was worse—molecular weights were only a few hundred. By accident, Leon St. Pierre, working with me, discovered that potassium hydroxide would catalyze the polymerization even at room temperature, to give polymer of 4000-6000 molecular weight.[4] We were surprised to find that this liquid polymer, which we presumed to be a diol, gave almost no change in viscosity on treatment with diisocyanates. It was surprising to find that samples of liquid polymer made by hot alkali polymerization and sold by a major poly(propylene oxide) producer as material terminated at one end by hydroxyl and the other by alkoxyl, thus presumably monofunctional, gave excellent rubber on treatment with diisocyanates! The answer to these riddles came from establishment of the importance of a chain-transfer process involving attack on the methyl hydrogen of the monomer . . . This incorporates allyl ether end groups at one end of polymer chains, as demonstrated unequivocally by St. Pierre[4].

The next puzzle was what happens to eliminate these groups in the hot alkaline polymers? The key to this was the discovery by Dege, Harris and MacKenzie[5] indicating that, when polymer prepared by sodium hydroxide catalysis at 150° was isolated without hydrolysis, *cis*-propenyl

ether groups were incorporated. We have now demonstrated that this group arises from base-catalyzed rearrangement of allyl ethers to *cis*-propenyl ethers. For example, in dimethyl sulfoxide as a solvent, even at room temperature, potassium *t*-butoxide will rearrange phenyl allyl ether in minutes to 99 + % yield of phenyl *cis*-propenyl ether.[6] The ready hydrolytic conversion of propenyl ethers to alcohols and propionaldehyde is established in the literature.

Another facet of propylene oxide polymerization which piqued curiosity was the opportunity it offered to explore the long unanswered question of the effect of configuration of asymmetric centers along a polymer chain on the physical properties of the polymer. In contrast to vinyl polymers, the asymmetric center of poly(propylene oxide) is already present in the monomer.

Using such optically-active monomer,[7,8] Dr. Maseh Osgan[9] discovered that a new type of poly(propylene oxide) was formed, not a liquid as from ordinary DL-monomer, but a crystalline solid. This discovery, concurrent with the discovery of crystalline polypropylene by Prof. Natta[10], gave strong support to his proposal that his new crystalline polymer also differs from earlier forms in having all the asymmetric atoms in the same configuration. In his case the isotactic arrangement had been imposed by the stereospecificity of the catalyst used for polymerization.

While our work was in progress, Pruitt and Baggett[11] revealed that certain iron catalysts were capable of making two new forms of poly(propylene oxide), both differing from earlier products in having much greater molecular weight, and one being a crystalline polymer, m.p. 71°. This product we showed to have identical crystalline structure to our optically active polymer[9b], so the catalyst disclosed in this patent was, like Natta's, stereoselective.

Dr. Osgan[12], based on our speculation about the mechanism of action of this catalyst, developed a whole family of Lewis acid type catalysts for the isotactic polymerization of propylene oxide and its analogs. These leads were further expanded by the discoveries of Prof. Furukawa[13] in Kyoto, and Ed. Vandenberg[14] at the Hercules Powder Co., of water-activated zinc and aluminum alkyl catalysts. It is now easily and economically possible to prepare homo- and co-polymers with molecular weights in excess of a million. Some years ago, Allen Noshay, working with me at Penn, showed that copolymers with unsaturated epoxides could indeed be prepared and were readily cross-linkable to rubbery material which

was swollen but undissolved by organic solvents. Since this material has low cost and superior rubber qualities, this material may have a big future —and may even become the basis for superior tires.

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Charles C. Price -- Scientist With Ideals

Dr. Ralph Connor

Vice President in charge of Research and Chairman of the Board of Directors, Rohm & Haas Co., West Washington Sq., Philadelphia 5, Pa.

(Presented when Dr. Price received the Honor Scroll of the Philadelphia AIC Chapter, Feb. 2, 1961, Philadelphia, Pa.)

DR. CHARLES C. PRICE is an honest, sincere and modest person with high ideals to which he holds firmly. He has a great ability in many different types of activities and he undertakes nothing in which he does not attempt to excel.

The saying, "A prophet is not without honor save in his own country" is not always true. This is indeed, the "Country" of the Prices. Dr. Price was born in New Jersey but his family came from Swarthmore and Plymouth Meeting. Mrs. Price was raised in Lansdowne. Dr. and Mrs. Price, as their parents had done, graduated from Swarthmore and after being away twenty years, returned.

Dr. Price received the Ph.D. in 1936 from Harvard where he had worked with Prof. Fieser. He then spent 10 years at the University of Illinois, starting as research assistant to Dr. Roger Adams, and progressed through the faculty grades of instructor, assistant professor, associate professor, and professor. In 1946 he became head of the Chemistry Department of Notre Dame. He resigned 6 years later to undertake some political activities, and was then reappointed. In September 1954 he became head

of the chemistry department of the University of Pennsylvania.

During the war, Dr. Price worked on research projects for the National Defense Research Committee and the Committee for Medical Research, and for this he was awarded the Army-Navy Certificate of Appreciation. Since the war, he has contributed to Government scientific activities on assignments for the Atomic Energy Commission and the National Science Foundation. He has been a member of the editorial board of the *Journal of Organic Chemistry*, *Chemical Reviews*, the *Journal of Polymer Science* and *Organic Syntheses*. He has been a member and chairman of the Committee on Nominations and Elections and the chairman of the American Chemical Society Committee Advisory to the Chemical Corps. His contributions in this assignment won him the Department of Army Commendation for Meritorious Civilian Service. He has been the author of about 200 papers and has obtained about 20 patents. In 1946, he received the ACS Award in Pure Chemistry; in 1950 the Honorary Degree of D.Sc. from Swarthmore, where he now serves on the Board of Managers. He received the Honor Scroll of the Chicago AIC Chapter in 1955.

Chemists often say we should be more active in public affairs but most of us do not do much about this. It is characteristic of Dr. Price that when he reached a conclusion he tried to do something. Recognizing the importance of international cooperation, he became interested in the United World Federalists and became active in the organization in 1948. He is now its president. The depth of his convictions of an obligation to society led him to become a candidate in 1950 for the Democratic nomination for U. S. Senator from Indiana. While he lost the nomination by a narrow margin, it was an unusual showing for a man inexperienced in politics who had lived in the State only 4 years. In 1952, he was nominated to Congress but lost in the election. Considering the pattern of his accomplishments, it is highly probable that he could have become an important political figure if he had chosen to continue this activity.

While it would have been good to have a man of his high integrity in public office, there are few who could have served society as he has done in training students and in conducting important research. His decision not further to seek public office was based upon his opinion that he can do more good in his present activities. Certainly, chemistry is better off for this decision, as well as the students from this country and throughout the world who have been trained by him.

Dr. Price has not dropped his interest in working for international

understanding. He has served on the Advisory Committee on International Issues of the American Friends' Service Committee, the Friends' Committee on National Legislation, the Executive Committee of the Commission to Study the Organization of Peace, and the Board of Directors of the American Association for the United Nations.

Dr. Price is not only a pleasant and cheerful associate, but he has always found time for athletic activity. At Illinois he was a faculty squash champion; in more recent years, his recreation has been sailing, an interest shared by his wife, his son, and his four daughters. When they moved from South Bend to Lansdowne, they sailed their yacht, Proton, from Lake Michigan through the St. Lawrence and down the coast to the Chesapeake. Dr. Price has twice won the season championship in the racing division in the Chesapeake Bay Yacht Racing Association.

Dr. Price is an outstanding scientist who does not limit his interests to furthering his own research, but who has contributed to professional activities, has given important service as a citizen, and who is a good sportsman.

(For the Citation to Dr. Price, see page 145)

John C. Moore, F.A.I.C., president, Moore Research Labs., Inc., 6306 Winston Drive, Bethesda, Maryland, announces that the firm is expanding to add a new marketing service that includes both development of marketable paints and related coatings and recommendations for sales promotion programs oriented to the needs of the paint user. This service supplements the existing laboratory activity of testing and evaluating paints and coatings for serviceability and conformance to specifications.

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Management's Responsibility to Research Personnel

(Excerpts from the Perkin Medal Acceptance Address of Dr. Carl F. Prutton, Feb. 3, 1961).

IN order to achieve a commercial success based on research, management must be certain that each man or group, outside (and inside) the research department, who will play an important role in the later stages of a new development, must be completely capable and fully motivated for their assignments. For example, how could one count on effective aid on a new project from a sales department which is so conservative that it wants simply to sell standard, well-established chemical products, and is antagonistic to all ventures into the area of marketing new materials? Even in production, some plant managers dread starting up a plant involving a new process or product, and therefore resist any deviation from old practices.

Courage, capability, and the desire to grow through new products and processes stemming from research must be instilled into the entire management staff in all branches of the corporation, as well as in the research department. Such attitudes can only be inculcated into a corporation through the policies, decisions, judgments, actions and convictions of corporate management, backed up by the owners of the corporation.

The active leaders of a corporation must, in addition, sell a growth program, including its cost and its problems, to the directors and owners of the company, and keep them sold, even through periods of adversity. Without real "financial patience," building a "growth" company in the chemical industry will be most difficult.

In a well-integrated program based upon research, creative and productive research personnel are essential to its success. Special considerations in status, salaries and incentive payments must be fully adequate to motivate the creative members of this scientific team. These exceptional individuals must be treated as professional employees and given considerations beyond people engaged in less creative work.

Outstanding researchers should be granted the opportunity of realizing salaries which might even be greater than salaries of the managers to whom they report. Such key research personnel should also participate in a major way in management bonuses, stock options and other economic incentives. Reasonable freedom in publication of their results and other forms of professional recognition, are other forms of intangible reward for these professionals.

Rapid fluctuations in research budgets are strong indications to research personnel of management's instability and lack of ability to appreciate and manage a productive research program.

When members of management reap great economic returns from their services, they expect and do receive stock options, bonuses, and unusually exceptionally good treatment. Should a creative researcher receive less?

Management must constantly keep in front of their research men the broad areas for logical growth through new developments—particularly where such breakthroughs fit in with the special assets or advantages and with the planning of the corporation.

Management has in its hands a primary responsibility for the ultimate commercial success of a research program. Without the completed successes of ventures based upon their efforts, research personnel become frustrated, and realize their insecurity in a company which lacks management with leadership and abilities required to obtain good economic returns on their research breakthroughs.

James W. Perry, F.A.I.C., recently became a member of the faculty of the Systems Engineering Department of the College of Engineering at the University of Arizona. Methods and techniques for applying electronic automation to non-numerical information is his principal field of interest.

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"Professional Income of Engineers, 1960" $3.00. Engineering Manpower Commission, 29 W. 39 St., New York 18, N. Y.

"Salaries & Income of Engineering Teachers 1960." 25-cents each. Engineering Manpower Commission, 29 W. 39th St., New York 18, N. Y.

"Engineering Professionalism in Industry." A survey. $4.00. National Society of Professional Engineers, 2029 K St., N.W., Washington 6, D.C.

"Film Guide on Chemicals, Chemistry & the Chemical Industry." Lists 223 films. Request from Manufacturing Chemists' Association Inc., 1825 Connecticut Ave., N.W., Washington 9, D.C.

Organic Chemistry -- Touchstone of Modern Progress

"All Industry is Gradually Becoming Chemical Industry"

Dr. Geroge D. Palmer, F.A.I.C.

Professor of Chemistry, University of Alabama
Secretary, Southern Association of Science & Industry
33 Gilmer St., S.E., Atlanta 3, Georgia

(The author, known as the "Father of SASI" prepared this paper for The SASI Newsletter, Jan. 1961, where it appears in greater detail.)

EVENTUALLY practically all industry will be absorbed into the chemical industry. Whereas now only about 50 of the largest companies, as DuPont, Union Carbide, Dow, etc., which are almost entirely chemical, are classed as such, many others should be classed as chemical. For example, the rubber companies—now deeply into synthetic rubber and a host of plastics—are really chemical producers. Hundreds of millions of dollars worth of plants in the oil industry are currently devoted to the production of a wide variety of petrochemical items, a field destined for enormous growth. The paper and pulp industry is daily getting more involved in the chemistry of cellulose and related products; special papers and films are developed from new chemical treatments. Paper industry byproducts, like "tall oil," formerly worthless, are now becoming valuable through chemical treatment. And so the story goes in almost all branches of production; chemical processes and applications are revolutionizing old procedures.

How it Came About: We live in a complex civilization in which a myriad of chemical products, especially organic chemicals, play a basic, fundamental role. Before their appearance there was first the basic chemical research in educational scientific institutions, and then a vast systematic application of developmental research in a host of industrial laboratories.

Organic chemistry is the broadest and most profitable field of research applied to industry, and yet few but trained technical men know much about organic chemistry. There are more scientists, more scientific papers on organic materials, and much more application to industry in organic chemistry than in any other field. Indeed, there is no industry that does not involve organic chemistry! It is an industrial miracle of organic chemistry that a substance such as a vitamin, which was for years studied only in its absence—lack of which caused deficiency diseases—is now synthesized and sold in boxcar lots.

It is almost incredible that our present chemical civilization was started from basic or academic chemistry built up almost entirely between 1850 and 1900 in Germany. Germany was the leader in all the basic

sciences, especially chemistry, up to about 1930. This came about because the professor in Germany was a very important man, respected by industry, government, and the republic, and because there was a direct tie-up with the chemists in the laboratories of the colleges and the men who applied this chemistry to the industries.

Chemistry did not develop appreciably until after 1800. Then Black and Lavoisier obtained significant numerical results by using the balance, or simply scales, to weigh their materials in chemical work. This application of numbers to chemistry did as much for the chemist perhaps as the application of the wheel did for man in the dim past.

Organic Chemistry—Big Breakthrough: The year 1828 is probably the most important date in organic chemistry. In this year, Woehler, a German chemist, prepared urea by heating ammonium cyanate, and so for the first time a well-known animal product, previously considered to require life itself or some "vital spark" for its manufacture, was prepared by man from inanimate substances, or the elements themselves. In place of the old idea that some "philosopher's stone," or "magic wand" was necessary to produce the organic substances that constitute plants and animals, there evolved the new idea that organic substances could be prepared in the laboratory from the elements and their compounds. Woehler might well have shouted, Urea! Urea! I have found it! Thus from this simple experiment came the first industries based on systematic large scale chemical research. These were chemical industries dealing with dyes, perfumes, flavors, explosives, coal tar products, and many other organic materials. Prior to this, no synthesis work in organic and little in inorganic chemistry had been attempted, though before 1828 chemists distilled many organic substances and mixtures, extracted the residues with solvents, and performed other laboratory operations.

Playing with Pictures: After 1828, and after preparing many substances and studying their experiments, chemists began to draw "pictures" of the molecules, as an architect draws house plans. From these "pictures" they predicted that certain atoms could be changed or replaced by others and that new materials with new properties should result. This came about because Kekule, a German chemist, in 1865 while on an omnibus in London, dreamed about carbon atoms that danced. He saw his beloved benzene (C_6H_6), line up and assume the form of a chain of six carbon atoms with bonds representing electrical attractions, and finally one end electrical attraction bond reached around to the other end bond and formed a hexagon, which is its chemical formula today. This started the idea of all of

our wiggle-tail or "picture" formulas which is at the basis of everyday organic chemical research. This in turn started the great dye and explosive industries and many others, our organized research laboratories, and hence our present chemical civilization. It is most significant that before entering the field of organic chemistry, Kekule was a student of achitecture.

After Kekule's dream, the organic chemists produced many natural products as well as many that nature had never prepared—all based on prediction from these wiggle-tail formulas. Due to the economic value of many of these substances, a steady flow of new organic compounds poured forth, especially from the laboratories of Germany, so, that by 1900, there existed over 100,000 newly synthesized or isolated organic compounds.

There are almost one million synthesized organic compounds today composed of carbon and other elements; yet from all the other elements without carbon there are not many more than 30,000 compounds . . . Molecules comprised mainly of carbon and hydrogen in either branches or chains have been of tremendous commercial significance. Atoms or groups of atoms may replace the carbon and hydrogen to form many different derivatives. It is this simple idea that is the basis for the systematic prediction of many millions of possible organic compounds . . .

Industry uses the cheap indirect plant and animal sources of organic compounds, such as coal, shale, natural gas, and petroleum. From these, and from plant sources such as wood and cotton, man has separated and synthesized most of the carbon compounds such as dyes, drugs, perfumes, flavors, plastics, paints, pyroxylin, explosives, synthetic rubber, rayon, etc. From coal alone more than 150,000 organic materials have been prepared.

Not only were many industries created between 1850 and 1900, but many other applications of organic chemistry were developed, such as in the fields of medicine, nutrition, agriculture, biology, and others. In addition, Pasteur, an organic chemist, discovered the science of bacteriology and is called its father by many, although others regard Robert Koch as its founder. Bacteriology is likewise primarily organic chemistry.

Thus, we find laboratory research in organic chemistry, which began in 1828, starting all types of later research. The profits, made from this laboratory research, were applied to old industries and the creation of many new industries, resulting in new profits, which were spent in turn on other types of research—mechanical, electrical, etc., until today we have our highly organized, extensive industrial factories of research, most of which are in the United States. This is now what makes us so different from other nations!

Professional Appointments

Apr. 4, 1961. Niagara Falls, N. Y. Red Coach Inn. Meeting of Niagara Chapter. Speaker: Dr. Raymond Ewell, Vice-Chancellor of the University of Buffalo and Consultant to the Government of India. Subject: "Development of the Fertilizer Industry in India and Southeast Asia." Dinner 6:30 p.m. For reservations: Dr. A. F. Shepard, Hooker Chemical Corp., Grand Island, N. Y. Telephone RR3-7511, Ext. 610.

Apr. 6, 1961. Philadelphia, Pa. Engineers' Club. Luncheon meeting of Philadelphia Chapter 12:15 p.m. Speaker, Dr. Emil Ott, F.A.I.C., former AIC president. Subject: "The Objectives of the AIC." For reservations: Dr. C. K. Deischer, Univ. of Pennsylvania, Philadelphia, Pa. EVergreen 6-0100, Ext. 8317.

Apr. 12, 1961. Meeting of Ohio Chapter. For information, John Dickenson, IV., Chapter Chairman, 2894 Fontenay Road, Shaker Heights 20, Ohio.

Apr. 13, 1961. Watertown, N. Y. Hotel Woodruff. Social hour 6:30 p.m. Dinner 7:30 p.m. Meeting of Beaver Falls Chapter with TAPPI. Speaker, Dr. K. A. Arnold, T.D., St. Regis Paper Co., New York, N. Y. Subject: "The Planning of a Technical Center." For information: Carlton Force, Latex Fiber Industries, Beaver Falls, N. Y.

Apr. 19, 1961. Chicago, Ill. Beaubien Room. Meeting of Chicago Chapter. Speaker, Dr. E. J. Sparling of Roosevelt University. For information: Chicago Chapter Secretary, Miss Helen Selin, 6916 N. Wayne Ave., Chicago 26, Ill.

Apr. 19, 1961. Newark, N. J. Military Park Hotel. Dinner and Meeting of New Jersey Chapter. Presentation of the Honor Scroll of the Chapter to Dr. L. T. Eby, F.A.I.C., Assistant Manager, Market Development Div., Enjay Chemical Co., Elizabeth, N. J. For information: Dr. Ralph M. Hill, New Jersey Chapter Secretary, 24 Bayberry Lane, Mountainside, N. J.

Apr. 22, 1961. Tucson, Arizona. University of Arizona. All-day program on information retrieval, entitled, "Living with Computers and Their Offspring," followed in the evening by presentation of Honorary AIC Membership to James W. Perry, F.A.I.C. For program information, query the College of Engineering, University of Arizona, Tucson, Ariz.

Apr. 27, 1961. New York, N. Y. Shelburne Hotel, 38th St. and Lexington Ave. Meeting of New York Chapter. Social Hour 6:00 p.m., dinner 6:45 p.m. Presentation of Honorary AIC Membership to Dr. Lloyd Van Doren, F.A.I.C., long-time AIC Secretary. Subject of address, "Chemical Patent Procedure." For reservations: Dr. K. S. Konigsbacher, c/o Evans Research & Development Corp., 250 E. 43rd St., New York 17, N. Y.

May 4, 1961. Valley Forge, Pa. Tally-Ho Hotel-Motel, Route 202. Meeting of Philadelphia Chapter. Dinner 6:30 p.m. Annual Student Award night. Outstanding senior students in chemistry and chemical engineering in colleges and universities in Philadelphia area will receive awards. Presentation: 8 p.m. Lecture 8:30 p.m. Speaker, Dr. Arthur Osol, F.A.I.C., Philadelphia College of Pharmacy & Science, Philadelphia, Pa. Subject: "Education for Excellence—a Price of Freedom." Deadline for reservations, April 28, 1961. Contact: Dr. C. K. Deischer, Univ. of Pennsylvania, Philadelphia, Pa. EVergreen 6-0100, Ext. 8317.

May 10, 1961. Washington, D.C. Statler-Hilton Hotel. The AIC President's Reception to the National Council, Members of the Annual Meeting Committees, and their wives. 5:30 p.m.

May 10, 1961. Washington, D.C. Statler Hotel. Dinner Meeting of the AIC National Council, Board of Directors, and 38th Annual Meeting Committees.

May 11, 1961. Washington, D.C. Statler Hotel. Breakfast meeting of the Committees on Membership and on New Chapters and Expansion. Others interested are welcome. For information: Dr. L. T. Eby, 1105 DeWitt Terrace, Linden, N. J., or Martin B. Williams, 1013 Pratt Ave., N.E., Huntsville, Ala.

May 11-12, 1961. Washington, D.C. Statler-Hilton Hotel. The 38th Annual AIC Meeting. "The Key to Valuable Information." See this issue of THE CHEMIST for Program. The Washington AIC Chapter will be our host.

May 12, 1961. Washington, D.C. Statler Hotel. Annual AIC Business Meeting 2:00 p.m. Reports of Officers, Chapters, Committees. Old and New Business. Announcement of Election of Officers.

May 12, 1961. Minneapolis, Minn. (Place to be announced) Meeting of Twin City Chapter. Presentation of student medals. For information: Dr. H. L. Weisbecker, 2138 Berkeley Ave., St. Paul, Minn.

May 17, 1961. Chicago, Ill. Beaubien Room. Meeting of Chicago Chapter. Speaker, Dr. Gerald Gordon, E. I. du-Pont de Nemours & Co. For information: Chicago Chapter Secretary, Miss Helen Selin, 6916 N. Wayne Ave., Chicago 26, Ill.

May 25, 1961. New York, N. Y. Place to be announced. Presentation of the Honor Scroll of the New York Chapter. Honoree and details to be announced.

May (latter part) **or June 1961** (early). **New Orleans, La.** Student Medal Award Meeting of the Louisiana Chapter. For information, Mack F. Stansbury, Chapter Chairman, Southern Utilization R & D Div., 1100 Robert E. Lee Blvd., New Orleans 19, La.

June 6, 1961. Niagara Falls, N. Y. Meeting of Niagara Chapter. Student medals will be presented. Place, subject and speaker to be announced. For information, Prof. Howard W. Post, Chapter Secretary, Chemistry Department, University of Buffalo, Buffalo 14, N. Y.

June 21, 1961. Chicago, Ill. Beaubien Room. Meeting of Chicago Chapter. Speaker, Dr. A. Allan Bates, Portland Cement Association. For information: Miss Helen Selin, Chapter Secretary, 6916 N. Wayne Ave., Chicago 26, Ill.

May 10-11, 1962. Chicago, Ill. Edgewater Beach Hotel. The 39th AIC Annual Meeting. The Chicago AIC Chapter will be our host.

Twenty-six Special Summer Programs in science are being offered at Massachusetts Institute of Technology, Cambridge 39, Mass. Request information from M.I.T.

Philadelphia Charter Presents Honor Scroll

The Honor Scroll of the Philadelphia AIC Chapter was presented to Dr. Charles C. Price, F.A.I.C., chairman, Department of Chemistry, University of Pennsylvania, Philadelphia, Pa., at a dinner meeting held at the Penn-Sherwood Hotel, Philadelphia, on Feb. 2, 1961.

Dr. E. M. Kipp of Sun Oil Co., Marcus Hook, Pa., chairman of the Chapter presided. Dr. Ralph Connor introduced Dr. Price. Dr. Milton Harris, AIC president, presented the Honor Scroll to Dr. Price, who responded with the story of the development of poly(propylene oxide) rubber. (See pages 131 & 136 for these talks.)

The citation on the Honor Scroll to Dr. Price reads:

To: Charles Coale Price

In recognition of his academic and professional activities demonstrated by his inspiring teaching of chemistry and guidance of his students, for his creative work in the study of the fundamental effect of structure on the properties of molecules and for his dedication to the betterment of man.

ACS Plans on Professional Relations

The Chicago AIC Chapter met Jan. 18, 1961, at the Beaubien Room of the Prudential Plaza, to hear David A. H. Roethel, manager of Professional and Government Relations of the American Chemical Society, speak on the "Society's Plans on Professional Relations." The *Chapter Chatter*, newsletter of the AIC Chicago Chapter, commented, "The title of this talk . . . is tangible proof that the long years of effort by the AIC to awaken a sense of professional consciousness in chemists, and to interest the ACS in promoting such a policy, is finally bearing fruit. After the long period of 'whistling in the dark,' this is a welcome development."

The Formation of the Golden Gate Chapter

An organization meeting of the new Golden Gate Chapter was held Jan. 19, 1961, at the Benjamin Franklin Hotel, San Mateo, Calif. Dr. Vandeveer Voor-

hees, F.A.I.C., of Los Altos, Calif., who arranged for the meeting, presided.

Dr. Lloyd A. Hall, Hon. AIC, came from Pasadena to speak on "Our Function in the Continued Progress of the AIC." The members present were unanimous in favor of establishing a new Chapter. In this, they were probably influenced considerably by the stimulating talk given by Dr. Hall, who spoke encouragingly of the work of the AIC and its potential.

From a dozen or so suggested names, the name "Golden Gate Chapter," was finally selected, and its territory was defined as California north of Parallel 36. A petition was signed and sent to the AIC requesting permission to become a new Chapter.

A pleasant interlude in the meeting was occasioned by a telephone call from Martin B. Williams, chairman, AIC Committee on New Chapters and Expansion, who extended his congratulations.

ACS-AIC Joint Meeting in Los Angeles

(Reported by Dr. W. David English, F.A.I.C. The complete report appears in SCALACS, publication of the Southern California ACS Section.)

Dr. Arthur C. Cope, F.A.I.C., president, American Chemical Society, was welcomed to Los Angeles, Feb. 9, at a joint meeting of the Southern California Section-ACS and the Western Chapter-AIC, in Roger Young Auditorium.

At the short business meeting, it was announced that the Richard C. Tolman Medal Award would be presented to Dr. William G. Young of U.C.L.A., at the next Southern California ACS meeting. There was brief discussion of progress on professional status.

Dr. Cope spoke on "Unusual Transannular Reactions." He defined a transannular reaction as "a reaction resulting in substitution at a position which is activated only by the spatial proximity of a functional group situated across the ring." As an example, the oxidation of cyclooctene with peracetic acid in which, in addition to the expected cyclooctane-1,2-diol, an even larger yield of cyclooctane-1,4-diol is obtained.

When cycloalkenes of from 6 to 12 atoms were oxidized under the same conditions, abnormal products were found as traces from the C_9 and C_7 rings, increasing to 100% from the C_8, C_{10} and C_{11} rings, but the product was entirely 1,2 from cyclododecane. The mechanism was postulated to be an hydride shift in a carbonium ion intermediate. In the case of cyclooctene, the shift might be either 1,3 or 1,5; both would yield the same 1,4-diol. Deuteration of the three and the five positions in separate compounds (a ticklish synthetic problem) and investigation of the results of oxidation of the deuterides showed that the abnormal product was formed 39% by the 1,3- and 61% by the 1,5-shift.

Dr. Cope then outlined other transannular effects which involved medium sized rings. These included the formation of bridged rings and bicyclics from the reaction of bromides with silver acetate, etc. The transannular effects have also been noticed in reactions involving radical intermediates, such as the photolysis of azocyclooctane, where the products contain 3% of a bridged ring . . .

Dr. Cope paid tribute to recent analytical techniques in his talk. Without the gas chromatograph most of his work would have been impossible. The isolation and identification of an isomer in 0.1% yield in the presence of five other isomers in up to 90% yield could not be done by older methods.

After a short discussion which drew questions about ACS policy as well as transannular chemistry, the meeting was adjourned.

The Organization vs. the Creative Man

The Washington AIC Chapter met Feb. 14, 1961, at the Marriott Key Bridge Motor Hotel, Washington, D.C., to hear a panel discussion on "The Organization vs. the Creative Man," a consideration of the circumstances under which organizations enlarge and liberate human potentialities, and the conditions under which talents are depleted and constricted. Dr. Lindsy R. Harman, director of research, Office of Scientific Personnel, National Academy of Sciences-NRC, and Dr. Charles Ullmann, director of Management Institutes, Civil Service Commissions, were the speakers.

A Questionnaire

For Chemists and Chemical Engineers

LET us assume that you work for the chemical industry and that you have a B.S. degree in either chemistry or chemical engineering and that your son wants to take courses in college which would give him the best educational background, so that later on in life he may become more distinguished in this field than his father.

Assuming further that he will take five courses each semester (exclusive of electives) and that he will be required to take eight semesters or four years to get the Bachelor's degree, the question is just what courses must he take and how many semesters each? The total "course semesters" are not to exceed forty. We are not interested in whether your son is to be called a chemist or a chemical engineer, we just want to know what basic courses are essential to his success.

Number of Semesters

I. English

- ☐ **Rhetoric** _____
- ☐ **English Composition** _____
- ☐ **Report Writing** _____
- ☐ **Public Speaking** _____
- ☐ **English Literature** _____

II. Foreign Languages

- ☐ **French** _____
- ☐ **German** _____
- ☐ **Spanish** _____
- ☐ **Russian** _____

III. Mathematics

- ☐ **Advanced Algebra** _____
- ☐ **Calculus** _____
- ☐ **Differential Equations** _____
- ☐ **Other Advanced Courses** _____

IV. Physics, Pure and Applied

- ☐ **Elementary Physics** _____
- ☐ **Thermodynamics** _____
- ☐ **Mechanics** _____
- ☐ **Solid State Physics** _____
- ☐ **Electronics** _____
- ☐ **Other** _____

V. Chemistry

- ☐ **Elementary - both quantitative principles and descriptive matter.** _____
- ☐ **Physical Chemistry (Quantitative Principles)** _____
- ☐ **Organic Chemistry** _____
- ☐ **Analytical-Qualitative** _____
- ☐ **Analytical-Quantitative** _____
- ☐ **Analytical-Instrumental** _____
- ☐ **Analytical-Micro** _____
- ☐ **Chemical-Thermo** _____
- ☐ **Chemical-Kinetics** _____
- ☐ **Chemical-Literature** _____
- ☐ **History of Chemistry** _____
- ☐ **Bio-Chemistry** _____

VI. Economics

- ☐ **General** _____
- ☐ **Business Economics** _____

VII. Chemical Engineering

- ☐ **Chemical Engineering Principles** _____
- ☐ **Chemical Engineering Thermodynamics** _____
- ☐ **Chemical Engineering Economics** _____
- ☐ **Chemical Engineering Plant Design** _____
- ☐ **Chemical Engineering Controls** _____
- ☐ **Chemical Engineering Differential Equations** _____

VIII. OTHER ENGINEERING

- ☐ Principles of M.E. _____
- ☐ Principles of E.E. _____
- ☐ Principles of Others _____

IX. BUSINESS MANAGEMENT

- ☐ General _____
- ☐ Accounting _____

X. APPRECIATION COURSES

- ☐ Music _____
- ☐ Art _____
- ☐ Architecture _____

XI. THESIS

- ☐ Chemistry _____
- ☐ Chemical Engineering _____

XII. MISCELLANEOUS

- ☐ Wood Shop _____
- ☐ Machine Shop _____
- ☐ Surveying _____
- ☐ Sociology _____
- ☐ Political Science _____
- ☐ Philosophy _____
- ☐ History, American _____
- ☐ History, European _____
- ☐ Psychology _____
- ☐ Bacteriology _____
- ☐ Biology _____
- ☐ Have we forgotten something? If so, what? _____

Grand total of "Subject Semesters" (Not to exceed 40) _____

I have purposely omitted asking for your ideas regarding lab courses because you are going to have a tough enough time trying to decide what your boy should take out of the above list. I will be pleased to summarize all results and see that you have a copy of my summary, if you will send your questionnaire to:

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Hazelton Laboratories and Information for Industry, Inc., have jointly initiated a new *Food and Color Additives Directory* service. L. W. Hazleton, president of the Laboratories, says that the intent is to provide a means of keeping currently informed on the great mass of petitions filed, regulations issued, and extensions granted, by the Food & Drug Administration on some 3500 food additives and 135 color additives. The loose-leaf form of the *Directory* permits revisions and additions to be distributed to subscribers monthly. For information, write Hazelton Laboratories, P.O. Box 30, Falls Church, Virginia.

The operations and assets of Standard Oil Company (Indiana) and its subsidiaries, American Oil Co. and Utah Oil Refining Co., are now consolidated into American Oil Company. The Research & Development Department of Standard Oil Co. is now the Research & Development Department of American Oil Co., Whiting, Indiana.

An additional Nieman Fellowship at Harvard University, Cambridge, Mass., is offered this spring, called the Arthur D. Little Fellowship. It covers the full cost of a fellowship, tuition and stipend, for three years, beginning in September 1961. Applications will be received by the Nieman Foundation at Harvard up to April 15.

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The Association of Consulting Chemists & Chemical Engineers, Inc., 50 East 41st St., New York, N. Y., announces the election of the following officers: Dr. E. W. K. Schwarz, President; Dr. Robert Steckler, F.A.I.C., vice president; Emerson Venable, F.A.I.C., Secretary, and Martin Aaron, treasurer. Mrs. Cornelia d'Alexandre was named assistant secretary-treasurer and is responsible for operating the association's headquarters.

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